Exocentric Distance Judgments in Computer Generated 2D Images

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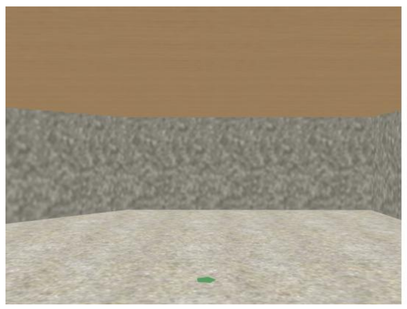
Introduction:

➢The quality and detail of computer graphics has been shown to influence distance judgments in interactive virtual environments

➢Kunz, et al. (2009) found that the quality of graphics influenced the accuracy of distance judgments in a 3-dimensional virtual environment



Low Quality Condition

High Quality Condition

➢Cue Theory states that we combine depth cues (such as texture and shadows) in order to perceive depth (Cutting and Vishton, 1995)

➢High quality graphics include important depth cues such as shadows and surface textures that may be missing in low quality graphics

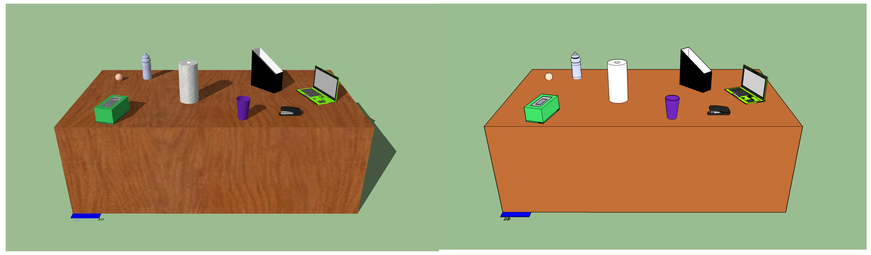
➢The importance of shadows as a depth cue was demonstrated in a study by Hu, et al. (2002) that suggests that the presence of shadows improved spatial judgment accuracy in interactive 2D images

➢The proposed experiment will investigate whether distance judgments between objects (exocentric) are more accurate in a high quality graphics condition than a low quality condition

Method:

➢Overview: Participant viewed high or low quality computer-generated versions of the desktop and objects shown below. They were asked to judge the distances between objects depicted in the computer-generated scenes.

➢Materials: Each scene consisted of a computer-generated desktop and 5-10 computer-generated objects positioned on the desktop in various arrangements



➢ High quality scene
  - ➢Shadow information
  - ➢Correct texture information

➢Low quality scene
  - ➢No shadows
  - ➢No textures

➢Procedure: For each trial, participants will:
  - ➢View a high or low quality scene
  - ➢Be prompted to judge the distance between two objects
  - ➢Verbally report the perceived distance using an arbitrary, standard unit

Predictions:

➢Shadow and texture information are useful distance cues in 2-dimensional computer-generated images
  - ➢Distance judgments will be more accurate when shadow and texture depth cues are available (high quality condition)

Results:

➢No statistically significant difference between the means
  - ➢Trending towards supporting our hypothesis

➢Changes could make enhance the differences between means
  - ➢Make the scale a smaller portion of the desk
  - ➢Have participants make different distance judgments in HQ and LQ trials

Implications and Future Directions:

➢Future studies will need to be conducted to see if shadow and texture information influence exocentric distance judgments in 2D images
  - ➢Shadow and texture information may not effect distance judgments
  - ➢Experiments conducted in 2D images may not apply to those in 3D virtual environments
  - ➢Exocentric distance judgments may be influenced by different depth cues than egocentric distance judgments

➢Still no answers as to why participants were more accurate in Kunz, et al.'s (2009) experiment
  - ➢Other secondary depth cues should be tested

References:

Cutting, J. E., & Vishton, P. M. (1995). Perceiving layout and knowing distances: The integration, relative potency, and contextual use of different information about depth. *Perception of Space and Motion, 5*, 69-117.

Hu, H. H., Gooch, A. A., Creem-Regehr, S., & Thompson, W. B. (2002). Visual cues for perceiving distances from objects to surfaces. *Presence: Teleoperators & Virtual Environments, 11*(6), 652-664. doi:10.1162/105474602321050758

Kunz, B. R., Wouters, L., Smith, D., Thompson, W. B., Creem-Regehr, S. H. (2009). Revisiting the effect of quality of graphics on distance judgments in virtual environments: A comparison of verbal reports and blind walking. *Attention, Perception, & Psychophysics*, *71*(6), 1284. doi:10.3758/APP.71.6.1284